

Excellent adsorption of complex dyes by graphene oxide-safranin modified@polyacrylonitrile membranes

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Graphene oxide (GO) is a nanomaterial that has a great potential for adsorbing contaminants from water [1]. Despite your potential, some characteristics of GO limit its use, such as its high electronegative charge and the difficulty in removing the nanomaterial from the water after adsorption. Thus, this work address the covalently insertion of an aromatic cationic dye (safranin-SF) into GO surface to reduce electronegative charges enabling GO-SF to adsorb electron-rich dyes. To facilitate the adsorbent recuperation after use, we performed the immobilization of GO-SF and GO in polyacrylonitrile (PAN) membranes. The new membranes, hPAN@GO and hPAN@GO-SF, were characterized by several techniques, such as Raman, Fourier Transform Infrared and X-ray Photoelectron Spectroscopies, Scanning Electron Microscopy and Zeta Potential. SEM analysis of hPAN@GO showed pores on the surface of the structure, while hPAN@GO-SF membrane showed non-porous rough aspect. Preliminary results involving the removal of cationic and anionic dyes by the hPAN@GO and hPAN@GO-SF membranes showed that hPAN@GO-SF had greater adsorption capacity for the basic blue 7 (BB7-183 mg g⁻¹), basic brown 4 (BB4-150 mg g⁻¹) and direct black 22 (DB22-71 mg g⁻¹) when compared with hPAN@GO (BB7=47 mg g⁻¹, BB4=70 mg g⁻¹, DB22=12 mg g⁻¹), suggesting that electrostatic, hydrophobic and π - π interactions are responsible for the adsorption. The new synthesized membranes are promising materials for the removal of a wide range of complex dyes, and the adsorption optimization system is underway in our laboratory.

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References:

[1] T. F. Neves, N. B. Dalarme, P. M. M. da Silva, R. Landers, C. S. F. Picone, P. Prediger, J. Environ. Chem. Eng. 8. 103820 (2020).